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ABSTRACT

The role of colleges and universities in regional research and service is considered on the basis of six institutional projects: Georgia Institute of Technology, Iowa State University, Oklahoma State University, Ohio State University, Pennsylvania State University, and the University of Tennessee. Case study summaries for each institution cover the function of the research or service program, procedures used, sources of support, and examples of projects undertaken, and the project director's name, address, and phone number. The institutional projects were concerned with the following areas: business and industrial productivity; technical assistance to manufacturing and processing firms regarding production and management; educational programs and conferences for local government; and technology transfer (i.e., providing technical information to firms using the resources and expertise of colleges). It is concluded that regional research and service activities of colleges and universities should seek to set priorities for teaching, research, and service; consider services related to the needs of business, industry, and government; initiate consortium arrangements with area colleges; and revise teaching and research functions to meet the needs of the outside community. (SW)

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THE ROLE OF COLLEGES AND UNIVERSITIES IN THE STIMULATION OF REGIONAL RESEARCH AND SERVICE

A Paper Presented by

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at

THE 17TH ANNUAL INTERNATIONAL CONFERENCE

OF

THE SOCIETY FOR COLLEGE AND UNIVERSITY PLANNING

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SUNY BUFFALO

AUGUST 1-4, 1982

During the period from 1950 to 1980, colleges and universities were concerned primarily with such problems as rapid enrollment growth, expansion of research efforts, and the development of new programs and curricula. In the same period, many regional agencies, organizations, and individuals became relatively independent of the colleges and universities.

There is every indication that the 1980s will be a period when substantial modifications must be made of the procedures and programs, both of the educational institutions and of the outside entities. With the nation encountering severe economic problems and with college and university budgets being curtailed, it seems essential that such institutions and the regional agencies join together to meet the challenges of the new era. Thus, it is the theme of this paper that in the 1980s there must be "bridges" built so as to improve the communication and interaction between and among the colleges and universities and the regional entities served by those institutions.

Method of Study

The present study was conducted by a research of related references, followed by a descriptive case study of the regional research and service activities of six selected institutions. The library review was initiated by an ERIC search of related subjects. Additional references were located through the independent investigation of the researcher.

The six institutional projects were selected by the researcher on the basis of those projects being pertinent to the present investigation. Each institution had a well-established and functioning research and service relationship with outside agencies. In order to obtain first-hand knowledge of the operations of each project, the researcher planned with each project director for a field site visitation. The researcher then spent one to two days on each campus, interviewing the director and other staff members and observing the operations of the project. In each case, the director supplied the researcher with extensive materials and publications pertaining to the operations and evaluation of the project.

After having reviewed related literature and having completed the six case studies, the researcher developed generalizations concerning the relationship between universities and colleges and outside agencies. Such a list of generalizations cannot be viewed as being exhaustive. However, it is hoped that the experiences of the institutions selected for the present study will be of assistance to college and university administrators who are interested in developing or expanding service-related programs.

Related Studies

There is evidence from the literature and from present-day experiences in higher education that colleges and universities currently are entering a new era. After summarizing American higher education for the past three decades, Bowen looked to the future by saying:

> What is done in the 1980s and beyond should be guided not alone by expediency related to keeping the colleges and universities afloat but also by a larger vision of where higher education could and should be headed in the twenty-first century.

> This part of the discourse on the place of higher education in American society is strangely and tragically missing. If we had this larger and longer vision, most of the questions about the 1980s would be resolved. Educators would know what ought to be done in the near future and they would have a firm basis, other than maintaining the status quo or passively adapting to the market, for seeking support from society.[1]

Bowen specified the role of higher education in the following manner:

> Higher education is, of course, not alone in the shaping of our people or in the shaping of our society. It shares these functions with the family, church, workplace, school, mass media, library, museum, peer group, social and political organization, casual conversation, and even private thought and meditation. Thus, part of the question about the education of our grandchildren relates to the division of labor among these many educational institutions or media of which higher education is only one. However, the influence of higher education should not be overlooked or belittled. It now serves about a third to a half of every age cohort of young people and touches the lives of millions of other persons in less intensive encounters; it trains virtually the entire leadership of the society in the professions, government, business, and, to a lesser extent, the arts; more specifically, it trains the teachers, clergy, journalists, physicians, and others whose main function is the shaping and guiding of personal development; it is the principal locus of basic research and scholarship; it is the main custodian of the cultural heritage; it supports a great pool of faculty talent available to consult on almost every conceivable practical question; and, as a highly visible presence in our society, it continually communicates its values and its concerns to the general public. The influence may have expanded in recent decades with the growth of enrollments and with increasing participation of faculties in public affairs and private consulting. In other respects, this influence may have waned as the institutions have become larger and less personal, as the proportion of students attending full time and in residence has declined, and as the institution's role <u>in loco parentis</u> has diminished. Despite these shifts in the depth of its influence, higher education remains a social institution of great actual power and of even greater potential power. It is one of the levers by which a society can affect its destiny. Higher education can be consciously and deliberately used to help shape the trend of a national, or even world, culture. It is, of course, not strong enough to overpower all other influences bearing on cultural development, but it is strong enough to count.[2]

The Carnegie Council on Policy Studies in Higher Education recently reviewed the recent accomplishments of higher education and predicted what might ensue during the 1980s and 1990s. While recognizing that

there are problems in colleges and universities, the Council held that there will be reasonable solutions to most of those problems. The Council recommended that it would be better to plan to meet the future effectively than to fear it as a new dark age.[3]

In anticipating the role of higher education in the next two decades, the Carnegie Council identified several contributions which would be needed, including the following which are pertinent to the present study:

> Abilities to provide even more constructive evaluation for national self-renewal
>
> Capacities to provide more services to the surrounding community
>
> Capability to maintain a network of contact and communication[4]

Bok recently called upon universities to look "beyond the ivory tower" and establish a plan for social action. Bok's thesis was that universities should not feel uncomfortable in taking account of society's needs; in fact, he maintained, universities have a clear obligation to respond to such needs. Bok placed restrictions in respect to social service only in making sure that the social problem is important, that dealing with the problem will not interfere with the freedom of individual professors and students, and that becoming involved in the social service will have a desirable effect on the operation of the university as a whole.[5]

The literature pertaining to service ventures by colleges and universities is extensive. A few examples of such projects and programs will provide the reader with some of the dimensions of such service activities. One such review was developed recently by the Chamber of Commerce of the United States. The Chamber developed a descriptive directory of thirty-seven productivity centers, most of which are

located at universities. These centers were described by the Chamber's Director of Productivity Centers, Jeffrey J. Hallett, as representing, " . . . the care of our national resource base of tools, techniques, and data which can be tapped as the country undertakes a new effort to raise productivity."[6]

An example of successful interaction between a university and a small industrial firm was recently reported in the Wall Street Journal. A small computer-programming company in West Lafayette, Indiana reduced labor costs by employing students from Purdue University as part-time programmers. University specialists in computer technology and marketing aided the company to establish a munufacturing routine and expand marketing operations.[7]

Zollinger examined the role of the university in cosponsoring research with state agencies. He maintained that with the magnitude of complex, public-policy problems encountered by state governments in the 1980s, state legislatures will be seeking the research expertise of the public university. While accepting the fact that there are several reasons for faculty impediments to state-sponsored research, Zollinger held that state-university research efforts could benefit both agencies.[8]

The involvement of community colleges in the problems of society was urged recently in a concept paper of the American Association of Community and Junior Colleges. Three national goals were cited as being vital to our society: ample employment opportunities, increased productivity, and economic health. Identified as the "missing link" at this particular time was the lack of a national policy on employment development and training.[9] The paper concluded by soliciting the assistance

of all community colleges:

> In summary, the nation's 1,231 two-year postsecondary institutions stand prepared to make a major contribution to training and retraining large segments of the nation's work force to meet the triple goals of high employment, increased productivity, and economic health. However, national leadership and a national policy framework are required if the "moon-shot" is to move from the launching pad.[10]

A related area of college and university service is that of corporate education and training. Brazziel estimated that between four and six billion dollars is spent annually on such activities. Brazziel conducted a study in 1978 of colleges and universities that were working to develop programs to meet corporate needs for personnel and for personnel development. The study sample consisted of 116 institutions nominated by a national panel. The evidence obtained indicated that there are many exemplary college and university programs for corporate education. While accepting the fact that much of such training will continue to be carried out in the business establishments, Brazziel maintained that colleges and universities could have an important role in such activities. The most important elements of such programs, he maintained, include non-traditional delivery formats and internship opportunities for advanced technical education students.[11]

One of the key elements in the success of a college or university service program is the cooperation of the faculty in such endeavors. Kanun studied the patterns of faculty response to service at the University of Minnesota. A survey questionnaire examining faculty involvement in community service programs was sent to 2346 members of the University of Minnesota faculty. With over 70 per cent of the faculty responding, Kanun concluded that the interest of the faculty in community service activities was high and that there had been no complete accounting of the

total impact of such activities, both on the university and on the community.[12]

Case Studies of Six Institutional Projects

In the appendix of this paper, the reader will find case study reports on visitations to six institutions. Each report includes basic information, area(s) of special concern, procedures utilized, sources of support, and examples of projects undertaken. While there are common elements among the six programs, it seems obvious that much individuality exists in respect to procedures, goals, staffing, funding, and outcomes. Since the purpose of the present report is to draw together suggestions concerning college and university service programs, it seems appropriate to complete the analysis of the case studies by going immediately to broadly-based recommendations about such programs.

Recommendations concerning College and University Regional Research and Service

Having reviewed a sampling of research studies pertaining to college and university service and having completed case studies of six institutions, the following generalizations concerning college and university service have been developed by the writer. The recommendations are general in nature; it is suggested that these be analyzed by individual administrators in respect to appropriateness for specific institutions.

It is recommended that the regional research and service activities of colleges and universities be expanded or established so as to meet the following criteria or goals:

1. That priorities be established for the teaching, research, and service functions. Most institutions have established priorities for teaching and research. If the service program is to be effective, it also must be subject to criteria of excellence. Close coordination among teaching, research, and service will be necessary if resources are to be used in the most effective manner.

2. That the specific service thrusts be identified and be related both to the needs of the community and to the capabilities of the institution. A college or university cannot assume responsibility for all of the problems confronted by the outside community. Conversely, it is an unwise use of institutional resources to provide services for which the community has not established a pressing need.

3. That particular attention be given to services related to the needs of business, industry, and government. At this time, when our society confronts many economic, social, and governmental problems, it seems logical that educational institutions attempt to solve or alleviate such problems. The most essential area of development currently is high technology. Universities and colleges can make substantial contributions in high technology, both by providing research expertise and by training specialists and technologists for the industry of the future.

4. That consortium arrangements with area colleges and universities be established. One arrangement which has been highly successful combines a major university with a network of community colleges. Such a cooperative program allows for a coordinated research and delivery effort.

5. That the service program be responsive to the needs and interests of the educational institutions and of the community. Close communication must be maintained between the service staff and the constituents. A "hot line" should be established so as to provide direct and effective access to and from the service office.

6. That a broadly-based advisory council be established to develop policies and to promote the service program. All elements related to the service program should be represented on such a council. The service program director should keep in close communication with the individual members and with the total council. It is essential that the council provide imput as to the direction of the service program.

7. That the financial support for the service program be clearly established, neither depleting the regular budget of the institution nor incurring a hardship to the agencies served. The most successful service programs have been funded from sources outside of the regular appropriation for the institution. While there should be no charge for initial services, long-term commitments and consultancies should be underwritten by the consumer. Faculty members engaged in such long-term activities should be paid equitably for such extra efforts.

8. That a successful service program be supported by an effective system of public relations. Faculty and staff personnel must be given full credit for their contributions to the outside community. Justification for the total service program will be dependent upon effective publicity about service projects. Publi-

cations pertaining to the program should be well-written, pertinent, and attractively produced.

9. That a systematic evaluation process be established to appraise the effectiveness of the service program, the service staff, and the advisory council. Guidelines for such appraisals should be developed in advance of the operation of the program and should be revised periodically. The information received through the evaluation process should be used for program improvement.

10. That the teaching and research functions of the colleges and universities be revised so as to meet the needs of the outside community. Business and industrial training should be job-oriented and should be delivered so as to allow students to remain on their jobs while preparing for new assignments. Research must be applicable to the needs of the community. A coordinated program of service, research, and teaching is essential.

Summary

The focus of this paper was on the role of colleges and universities in regional research and service. After examining pertinent references, the writer conducted case studies of six institutional projects. General recommendations were developed for the purpose of assisting college and university administrators in the establishment or revision of regional research and service programs in their own institutions.

References

[1]Howard R. Bowen, The State of the Nation and the Agenda for Higher Education (San Francisco: Jossey-Bass Publishers, 1982), p. 9.

[2]Ibid., pp. 9-10.

[3]The Carnegie Council on Policy Studies in Higher Education, A Summary of Reports and Recommendations (San Francisco: Jossey-Bass Publishers, 1980), pp. 194-206.

[4]Ibid., p. 200.

[5]Malcolm G. Scully, "Harvard's Bok Looks 'Beyond Ivory Tower': A Plan for Social Action by the University," The Chronicle of Higher Education, 26 May 1982, pp. 23-24.

[6]Chamber of Commerce of the United States, Directory of U. S. Productivity and Innovation Centers (Washington, D. C.: Chamber of Commerce, 1980), p. 2.

[7]"Luck, Planning Bring Success to Small Firm," Wall Street Journal, 14 April 1982, p. 27.

[8]Richard Zollinger, "State-Sponsored Research: Cooperation or Conflict?" Educational Record 63 (Spring 1982): 4-9.

[9]American Association of Community and Junior Colleges, Putting America Back to Work: A Concept Paper (Washington, D. C.: AACJC, 26 March 1982), pp. 1-10.

[10]Ibid., p. 9.

[11]William F. Brazziel, "College-Corporate Partnerships in Higher Education," Educational Record 62 (Spring 1981): 50-53.

[12]Clara Kanun, Patterns of Response: Faculty Community Service Survey (Minneapolis: Continuing Education and Extension Research Department, University of Minnesota, 1975), pp. 1-68.

Georgia Productivity Center (GPC)

Basic Information

Director: Mr. Rudy Yobs

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Georgia Institute of Technology
Atlanta, GA 30332

Telephone: (404) 894-3404

Area(s) of Special Concern

The Georgia Productivity Center (GPC), established by the Georgia General Assembly in 1975, has been described as being ". . . the nation's first state center dedicated to improvements in business and industrial productivity." The Center is housed in the Georgia Institute of Technology and provides problem-solving services in the following four areas: innovation, research and development, safety and environmental counseling, and human resources.

Procedures Utilized

The GPC staff consists of experienced engineers and management specialists whose backgrounds and expertise cover the broad spectrum of industrial groups. These individuals work within a network of eight field offices in strategically-located areas of Georgia. The field engineers become familiar with the manufacturers in their specific region and learn of the problems, needs, and areas for potential improvement of those manufacturers. With the support of the staff and faculty of the Georgia Institute of Technology, the staff members of the GPC work closely with plant personnel to clarify problems and to recommend action.

Because most small businesses cannot absorb the cost or incur the risks involved in traditional technology transfer, GPC provides most of its cost-free services to small and medium-sized firms. Since its productivity assistance is free to the user, GPC's technology transfer service encourages many firms to pursue innovations which might involve undue risk if attempted without outside assistance.

The GPC's program has been described as being a carefully-established pattern of linkages between the following three essential components:

1. Access to, and support provided by, the broad base of "state-of-the-art" technical expertise at Georgia Institute of Technology.
2. Field engineers with strong industrial experience who work directly with firms on productivity improvement.
3. A technical staff which serves as an intermediary between the technical information and expertise on the Georgia Institute of Technology Campus and the field engineers seeking to solve specific problems encountered at the firms with which they are working.

Sources of Support

The GPC is affiliated with the Engineering Experiment Station (EES) of the Georgia Institute of Technology. The EES is chartered by the Georgia legislative as a non-profit, client-oriented organization. Over 90% of the funding for the EES comes from non-appropriated funds. During the past year, some $40 million was raised from such outside sources to fulfill the service mission of the total research program of the EES. A substantial portion of this amount came from federally-supported research projects. The total operation of the EES is supported by more than 750 staff members, over 500 of whom are professionals.

Examples of Projects Undertaken

1. Two examples of work done by the Georgia Productivity Center were reported recently, as follows:

   A good example of GPC's work is the fifteen-year relationship it has enjoyed with the Rainbow Manufacturing Company, a manufacturer of irrigation systems in Fitzgerald, Georgia. The Productivity Center initially helped the firm with problems in its aluminum foundry, and later analyzed a problem of excessive vibration that was causing bearing failure in a centrifugal pump. The Center is currently assisting the firm in designing an electronic control system to direct the movement of irrigation equipment. Starting out with 12 employees and sales of approximately $1 million, Rainbow has grown to its present level of 135 workers and annual sales of more than $15 million.

   In another instance, GPC designed a preventive maintenance management system as a demonstration project in Haralson County because many Georgia counties are struggling with mushrooming repair costs on expensive road maintenance equipment. GPC developed a record-keeping and scheduling system to increase workers' motivation and arranged for equipment operators to get specific preventive maintenance training. Haralson County expects to shave 20% off its $300,000 maintenance and repair budget in the program's first year. Once the system is fully implemented, it can be modified for counties all over Georgia and elsewhere.

2. Particular emphasis is given by the GPC in working with small firms, especially those in rural areas where agricultural workers are being displaced by farm mechanization.

3. To encourage and stimulate the research and development activities of Georgia's manufacturing companies, the GPC offers an interdisciplinary laboratory staffed with forty-five experienced engineers and scientists working in applied research and materials development. This laboratory maintains an extensive collection of sophisticated instruments to analyze or identify materials, determine alternative solutions, and develop and evaluate new applications for materials. The laboratory works in process development, including

designing and building pilot-scale units for demonstrating and testing new processes.

4. Currently research is being conducted by the GTC in the following areas:

   Analysis of Manufacturing Productivity Trends in Georgia, the South and the U.S.

   The Impact of Governmental Regulations on Small Businesses in Georgia.

   Energy Conservation in Industry, State and Local Government.

   Survey of Sources of Wastes Potentially Convertible to Energy.

   Research and Prototype Development for Systems to Convert Agricultural, Industrial, Forestry and Municipal Wastes into Energy and Other Useful Products.

   Development of Improved Processing Technology for Georgia Industry.

   Productivity in Local Government Services.

   Labor Productivity.

   Productivity of the Handicapped.

   Industrial Health and Safety.

Other Information

1. A related agency to the Georgia Productivity Center is the Productivity Center of the College of Business Administration at Georgia State University.
2. Responding to the needs of Georgia and the nation in respect to high technology enterprises, the Advanced Technology Development Center (ATDC) has been established on the Georgia Tech Campus. The ATDC is sponsored by state, private, and Georgia Tech resources. The primary emphasis of the Center is to attract to Georgia high

technology alternate energy companies, electronics manufacturers, and high technology laboratories.

3. The Industrial Extension Division of Georgia Tech has become a vital resource in the development of the state's existing business and industry. To carry out these extension activities, Georgia Tech maintains eight field offices throughout the state.
4. The Manufacturing Technology Center (MTC) has been organized to identify and stimulate industrial technology. The specific areas of concern by the MTC include the following:
   a. Industrial controls, including programmable controller and computer applications
   b. Industrial robots for assembly jobs and jobs in hazardous environments
   c. Improved manufacturing control systems, including productivity measurement
   d. Instrumentation for detecting and predicting machine failures

Center for Industrial Research and Service (CIRAS)

Basic Information

Director: David H. Swanson

Address: 205 Engineering Annex
Iowa State University
Ames, Iowa 50011

Telephone: (515) 294-3420

Area(s) of Special Concern

The Center for Industrial Research and Service (CIRAS), established in 1963, is an agency of the Iowa State University Extension Service which assists owners and managers of manufacturing and processing firms. CIRAS has the mission to help Iowa industry to be more productive and to provide a safer working environment for Iowa citizens.

Procedures Utilized

Dr. David H. Swanson, Director of CIRAS, described the mission of the agency as recognizing, ". . . the benefits of strong manufacturing and processing sectors. It also reflects the value of integrating the skills and information of a university with the means of industrial production."

CIRAS has a central staff of ten professional and three secretarial persons. Six field staff persons also serve the agency, with locations in Waterloo, Creston, Davenport, Cedar Rapids, Des Moines, and Spencer. The goal of the staff is ". . . to provide the impetus for the educational, technical, informational, and management assistance programs of CIRAS."

At its present level of operation, over 7,100 contacts are made annually by the CIRAS staff with manufacturers and processors. These

contacts result annually in over 1400 projects, about half of which are handled directly by the staff. If additional assistance is needed, the CIRAS staff utilizes the expertise of outside consultants and of university faculty members.

The Advisory Council to CIRAS consists of leaders from business and industry, together with the Dean of University Extension and the Associate Dean of the College of Engineering of Iowa State University. Members are elected for three-year terms, with one-third of the group being replaced each year. The Council meets five times a year and members also represent CIRAS in their own communities by encouraging business and industrial firms to use the services of CIRAS and by helping in the organization of seminars and meetings.

Sources of Support

The basic support for CIRAS comes from a line item in the state budget. The current budget is $632,000. Of this amount, approximately 85% is used for wages and benefits and the remainder for current expenses. Travel costs take nearly half of the expense budget.

Special funds and grants also support the work of CIRAS. Recently, for example, a $100,000 grant was obtained from the Economic Development Administration for the purpose of providing additional management and technical services to the manufacturers and processors.

In order to justify CIRAS, systematic evaluations are made of conferences, projects, and office procedures. The results of these evaluations are used by the staff and the Advisory Council in an attempt to improve the operations of CIRAS.

Examples of Projects Undertaken

Among the services provided by CIRAS are the following:

1. The CIRAS News, a monthly newsletter, is distributed widely to business and industrial firms. Each issue emphasizes a special topic, as well as providing general information about developments in business and industry. Management guides also are developed periodically by the staff.
2. In addition to making over 7,000 contacts and engaging in over 1,400 projects annually, the staff holds clinics in such areas as finishing products, pricing, and marketing.
3. Information is supplied concerning research, technical papers, and patents. Some typical topics include how to use a log splitter, how to obtain methane production from livestock wastes, and how to utilize on-site waste treatment and disposal techniques.
4. CIRAS works extensively to expand international trade opportunities. Cooperating with the Greater Des Moines Chamber of Commerce, a Foreign Trade Zone Corporation has been formed. This agency anticipates that foreign-made components and raw materials will enter a zone, be converted to finished products by Iowa workers, and then the finished goods will be exported.
5. Production and managing assistance is provided in such areas as technology transfer, plant layout, material and product handling, painting and coating, procurement, government regulations, security and safety, product design, material characteristics, value analysis, equipment capabilities, prototypes and inventions, and production control.

6. Management assistance is provided in such areas as financial management and analysis, computers, cost analysis, business planning, management systems, purchasing, personnel and training, cash flow analysis, and starting a business.
7. Marketing and sales assistance is provided in such areas as marketing planning, introduction of new products, pricing, promotion, sales cost analysis, sales compensation, international trade, and channels of distribution.

Other Information

1. The CIRAS professional staff members and field representatives have had extensive education and experience in the business, engineering, agricultural, and scientific fields.
2. Recently emphasis has been given by CIRAS to technology transfer, innovation, and productivity. The College of Engineering of Iowa State University has established an Engineering Technology Assistance Program to work in these areas.
3. CIRAS recently developed a booklet entitled, "Financing Iowa's Economic Development." The purpose of this publication was to summarize for the business and industrial community what types of financial, management, and procurement assistance might be obtained.

Center for Local Government Technology (CLGT)

Basic Information

Director: Dr. James E. Shamblin

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Oklahoma State University
Stillwater, Oklahoma 74078

Telephone: (405) 624-6049

Area(s) of Special Concern

The Center for Local Government Technology is one of the Oklahoma State University public service programs. The Center was initiated in 1974. It provides technical assistance and educational programs to local governments, both at the municipal and county levels. The Center primarily responds to problems relating to engineering and management technology.

Procedures Utilized

The Center handles requests for technical assistance about short-term problems on an individual basis; providing information, consultation, or appropriate referrals, as needed. The Center has a "hot line" which local government officials can call collect to discuss their problems.

Formal workshops and seminars are developed and held for the user audience on topics having common interest or needs. Both local and national speakers are selected based on their technical competence and their ability to communicate with the attending audience. Less formal seminars are held for local personnel in meetings across the state. These typically address a specific topic and are presented in very operational terms. In some cases the Center works with individual state associations to host their annual training programs.

Handbooks and manuals are prepared to meet training needs on priority problem areas. Typically these areas are identified and requested by a body of local officials such as a state association or by an advisory board of users. The Center strives to prepare handbooks written in operational terms directly for the benefit of those responsible for "getting the job done." These are distributed on a state and/or nationwide basis.

On problems common to many cities or counties, fact sheets presenting possible solutions are prepared and distributed statewide. Some titles of such fact sheets are as follows:

Asphalt Paving
Maintenance of Aggregate Surfaced Roads
Effects of Drainage Design on Road Performance
Road Dust Control with Calcium Chloride
Fuel Management for a Vehicle Fleet
Providing Paved Parking Areas
Disinfection of Swimming Pool Waters
Scheduling Police Manpower
School Bus Routing
Procedures for Initiating, Upgrading, or Expanding Water and Wastewater Related Facilities

Handbooks and manuals also are published by the Center. Titles of such publications are as follows:

1. A Technical Assistance Program for Oklahoma Cities and Counties.
2. A Guidebook for Municipal Safety Programs.
3. Computers and Local Government.
4. Handbook for Newly-elected County Commissioners.
5. The Local Growth Management Guidebook.
6. Self Energy Management Plan for Oklahoma Apartment Owners/ Managers.
7. A User's Manual for a Management Control System for Street Maintenance.
8. A Guide for the Selection and Design of Solid Waste Management Systems.
9. Rate Adjustment Procedure for Municipal Services.

Particularly for those cases requiring a significant research and/or development effort, the CLGT may draw upon the broader resources of the university to supplement both expertise and manpower requirements. Often faculty and students are involved to provide both specific technical capability and a learning environment from the hands-on experience. These projects are often funded on an individual basis by appropriate mission agencies in state and federal government. The results are first field tested and then may become the basis for handbooks and workshops.

Sources of Support

The Center is a public service function of Oklahoma State University. It was initiated through a grant from the National Science Foundation. The Center now is supported by funds from OSU Extension, NSF grants and contracts, various other state and federal agencies, and user fees from workshops and publication sales.

Examples of Projects Undertaken

Some of the recent projects undertaken by the CLGT have included the following:

Road and Street Maintenance Conference. This conference was co-sponsored by the Oklahoma Department of Transportation and the Federal Highway Administration. County and local highway officials were invited to attend. A series of presentations was presented concerning road and street building and maintenance. A publication of the results was distributed to county and local offices.

Vehicle Equipment Management Conference. This CLGT conference was endorsed by the Oklahoma Municipal League. The program was

designed for people in positions of management over vehicle fleets; municipal, county, state, private, and industrial. Reports were given on "Parts Storage/Inventory Control," "Cost Records for Vehicle Management," "Starting a Vehicle Preventive Maintenance (PM) Program," and other related areas.

Building Inspection Guidebook. The CLGT, working with the Oklahoma Department of Energy, developed this resource book. Its purpose is to provide information for persons working in residential housing as to how to comply with the basic energy conservation code.

Ohio Technology Transfer Organization (OTTO)

Basic Information

Administrator of OTTO Office
at The Ohio State University: Ms. Patricia B. Herdendorf

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1712 Neil Avenue
Columbus, Ohio 43210

Telephone: (614) 422-5485

Area(s) of Special Concern

OTTO was founded by the Ohio Board of Regents in 1979 and is funded by the Ohio Legislature as a service to enhance the economic development of Ohio's businesses and industries. OTTO acts as a "broker" of technical information by using the resources and expertise found in Ohio's colleges and universities, as well as in state and federal agencies, to address specific problems encountered by Ohio's firms.

Procedures Utilized

OTTO is a confederation of thirteen technical and community colleges and The Ohio State University. Thirteen technology transfer agents, housed in the technical and community colleges, visit over 1,000 businesses annually. Initial visits serve two purposes: (1) to introduce OTTO's services to each businessperson, and (2) to acquaint the agent with the needs of that businessperson. About half of the initial visits result in follow-up inquiries.

Of the requests for assistance received during 1981, the areas of concern were as follows:

Techniques and Processes	23%
Engineering	19%
Training	6%
Energy Conservation	2%
Business Management	28%
Marketing	22%

The information resources of OTTO were described in a recent annual report as follows:

> As the number of requests at OTTO grows, so does the information base. In 1981, each agent had a resource base established at his/her college comprised of personal files, libraries, and faculty contacts. The agent also had access to the clearinghouse at OSU/OTTO, where the documents and responses to previous questions are maintained. Other resources utilized at OSU/OTTO include a vast library network and computerized literature data base (the Mechanized Information Center), OSU faculty, OTTO Resource Information System, Electronic Information Exchange System, and a researcher who worked full-time for the agents. Other resources commonly used by OTTO include professional and trade associations, and government agencies such as NASA, the Library of Congress, the National Bureau of Standards, and more.

Sources of Support

The Ohio Legislature allocates approximately $250,000 annually for the operation of OTTO. Each of the colleges and OSU contribute up to half of the operating costs for their individual offices.

Examples of Projects Undertaken

In the 1981 Annual Report of OTTO, several case summaries of technology transfer were presented. The following four cases are presented to indicate the nature of typical OTTO projects:

Case 1

A company which makes rust inhibiting chemicals requested a computer search for current technical literature on recent products and developments in that field. The search, conducted through The Ohio State University Mechanized Information Center, found 17 articles of interest, many from difficult to obtain Russian sources. Other information was obtained from research done by NASA. It is anticipated that this information will lead to the development of new or improved products which will contribute to additional profits. Estimated savings to the client in avoiding literature research costs is $1,000.

Case 7

A company that produces and sells a liquid fertilizer to farmers over a wide geographic area stores it in 30 ft. high cylindrical tanks scattered throughout the sales territory. To maintain an accurate inventory of liquid in these tanks, an employee is required to climb to the top of each tank periodically to measure the contents with a dip stick. This is both dangerous and time consuming.

To avoid this, OTTO proposed that a portable pressure gauge be applied to the existing 3 inch outlet pipe at the bottom of each storage tank, using the present "Kamlock" quick disconnect coupling. Upon opening on the discharge valve, the level of liquid in the tank can be quickly determined by reading the pressure exerted by the contents. Labor savings of $10,000/year will result when this proposal has been fully implemented and a dangerous task will be eliminated.

Case 9

A manufacturer of sintered powder metal parts was experiencing excessive die wear in its molding presses. The representative from NASA Lewis Research Center arranged to coat or treat eight different mold pins, each in a different manner. Each was then put in use and are currently under evaluation. It is anticipated that savings of at least $50,000/year will result from a solution to this problem, both in materials and in production rate.

Case 14

A manufacturer of special component products used in the nuclear industry employs fewer than 100 people and does not have an R & D facility. They were having difficulty identifying vendors that meet the government requirements for nuclear suppliers. They also had problems with machining the material. The properties of the material created some unique machining problems.

The client was provided with a comprehensive list of suppliers to the nuclear industry and a contact at the Machinability Data Center of the Defense Information Analysis Center to provide information relevant to the machining problems the firm was facing.

While the measurement of dollars saved cannot be exact in this case, a minimum of four days was saved and the company was made aware of information directly relating to their needs, free of charge.

Though OTTO has fourteen separate offices, each functioning as an independent entity, the following are some activities in which some or all the agents took part recently:

1. Boiler Efficiency and Safety Training Program. This program provided training for over 1200 boiler operators concerning combustion technology, pollution control, and operation safety.
2. Seminars were sponsored with the following topics: "How to Market Your New Ideas and Inventions," "Productivity Improvement," and "Propane Conversion."
3. Technological Resources Applied to Commercial Enterprises. This project (1) attempted to determine the most effective techniques and methods of transferring technology by examining demonstration projects, (2) applied new methods for technology transfer, and (3) sponsored a conference to reveal the results and to publicize technology transfer projects.

Other Information

The following summary of the OTTO operation at The Ohio State University, taken from the 1981 Annual Report, indicates the role of OSU in the OTTO operation:

> The OTTO office at The Ohio State University houses the program's administrator, Patricia Herdendorf, and researcher, Linda Cooper. The responsibilities of the OSU office are varied and crucial to the effectiveness and growth of the Ohio Technology Transfer Organization.
>
> Herdendorf, in addition to coordinating the activities, communications, and policies for the statewide network during 1981, has worked to link OTTO with other technology transfer groups. As a result, OTTO now has a national reputation and is often held up as an example of a viable mechanism for higher education-business technology transfer.

Ohio State, because of its size and diversity of disciplines, is a common resource used by the OTTO agents. Linda Cooper works for the agents in recovering information from OSU and from many other resources. Agents requested Cooper's assistance on 106 problems during 1981. And, though OSU/OTTO does not solicit clients, 22 requests came directly to the OSU office. More than 60% of the 129 requests responded to by OSU/OTTO related to engineering or techniques and processes, while business management topics made up the balance.

Pennsylvania Technical Assistance Program (PENNTAP)

Basic Information

Director: Dr. H. LeRoy Marlow

Address: 501 Keller Building
Pennsylvania State University
University Park, PA 16802

Telephone: (814) 865-0427

Area(s) of Special Concern

The Pennsylvania State University and the Pennsylvania Department of Commerce established PENNTAP in 1965. The principal function of this program is to provide professional expertise that will help business and industrial firms in Pennsylvania utilize technology resources to solve technical problems.

Procedures Utilized

The concept which is basic to the PENNTAP procedure is "technology transfer." This process involves the transfer of technological information from a PENNTAP center to the business or industrial firm needing assistance. Any Pennsylvanian who needs technical assistance or information may reach PENNTAP through any one of the twenty-three continuing education offices or through the PENNTAP headquarters at University Park. A technical specialist will return the call to clarify the problem. If the specialist needs additional information, a search is made through faculty, library, or computer sources. The direct response by the specialist may be by letter, telephone, an on-site visit, or at a conference involving field specialists from private or nonprofit sectors. The

information given to the business or industrial firm will include several options from which the user can make a decision.

PENNTAP's delivery system is based on the concept that beneficial results are best achieved when a personalized relationship exists between the person who has a problem and the resource which provides the possible answers. Another feature of the system is that all technical specialists are based at University Park, with their offices located in university departments appropriate for the specialists' individual fields of expertise.

An Advisory Council, appointed by the President of Pennsylvania State University, representing the business-industrial community, monitors the goals, policies, and activities of PENNTAP. Standing committees of the Council concentrate on developments in technology which may need emphasis, the role and services of the technical specialists, and the communication responsibilities of the various offices, agencies, and institutions involved in PENNTAP.

Sources of Support

Until 1970 federal funds were provided to PENNTAP under the Federal-State Technical Services Act of 1965. Additional support has been obtained annually through special appropriations of the Pennsylvania Legislature. The state appropriation has been matched by Pennsylvania State University. The average annual expenditure for the operation of PENNTAP has been approximately $325,000. On the basis of evaluation reports obtained from the business and industrial firms which have used PENNTAP, it is estimated that the annual savings to those firms is approximately $3,000,000. Thus, the benefit vs. the cost ratio is 14.4 to 1.

Examples of Projects Undertaken

Among the services provided by PENNTAP are the following:

1. Helping boroughs with problems of water supply and sewage, streets, curbing, sidewalks, energy, preventive maintenance, recreational facilities, and fire protection.

2. Assisting small businesses to improve their energy efficiency.

3. Assisting businesses and industries to keep current with technological developments.

4. Consulting with public school administrators about buildings, equipment, and vehicles.

5. Providing assistance to government, industry and business concerning transportation problems.

6. Through the Library Information System, conducting searches and making available copies of published scientific and technical literature.

Other Information

1. Dr. Marlow considers it an important principle that business or industrial firms should be able to have access to PENNTAP without charge. However, if a business wishes to hire a consultant, the resulting expenses should be paid by the business firm. There are from 1500 to 1800 such calls handled by technical experts in PENNTAP annually.

2. While PENNTAP is constituted to serve Pennsylvania, last year technical assistance was given to industrial firms in seven foreign countries and thirty-four states.

3. A Small Business Development Center, under the auspices of Pennsylvania State University but not directly related to PENNTAP, has an extensive involvement with area businesses.

You should have called PENNTAP first!

Center for Industrial Services, University of Tennessee

Basic Information

Executive Director: Mr. Reuben Harris

Address: 214 Capitol Building
Nashville, TN 37219

Telephone: (615) 242-2456

Area(s) of Special Concern

Authorization of an Industrial Research Advisory Service was provided through legislation of the Tennessee General Assembly in 1963. This agency was reorganized in 1970 and renamed the Center for Industrial Services. The major purpose of the Center has been described as, ". . . the coupling of industrial and business problems with sources of expert assistance." A strong correlative purpose of the Center has been, ". . . the creation of a wider, richer field of opportunity for faculty and student involvement in business and industrial projects."

Procedures Utilized

When a company has a problem that management recognizes, the Center's role is that of helping the management to bring the problem into clear resolution and to provide expert assistance to the manager. This process has been described by the Center's Director in the following manner:

> If the expert assistance is a professor with a Ph.D. in Metallurgical Engineering, the Center strives to place the professor across the desk from the manager, or at the mouth of the melting furnace with the production superintendent and the plant engineer. If the assistance needed calls for a copy of a technical article, the

> Center's reference librarian locates the article and, through the mail, or in urgent cases through the Center's field force, places the pinpoint selected document in the manager's hand at his normal work location. And the Center's field man is there to help the manager understand the article if necessary.

The experiences of the Center's staff have proven that the majority of the problems which managers confront are not technical problems requiring engineering solutions. The more challenging aspects of productivity improvement have been found to be in the areas of managerial skills, employee relations, finance, marketing and sales, and in state and federal regulations.

Over the last several years the Center has served the needs of industry through completion of projects at the average rate of 630 per year. The Center's files contain case studies describing improvements in manufacturing processes, plant layout, material handling, financial planning and record keeping, procurement procedures, and employee relations.

The Director has explained the organization and thrust of the Center in the following manner:

> The Center's present program consists essentially of a predominate, aggressive field thrust, supported by a small, but effective, in-house field support capability and more extensively by the very broad discipline-oriented expertise of the faculties of higher institutions of education within Tennessee.

There are eight field persons who work with industrial firms within their assigned areas. Over a period of time, these field representatives have become known as business and industrial liaison agents who assist management while maintaining the confidentiality of company problems.

The Center utilizes a Management by Objectives procedure to evaluate the effectiveness of its individual staff members and of the total program.

Sources of Support

For the past several years the Center has been funded entirely by state funds appropriated by the University of Tennessee. The budget currently is at $430,000 annually, with about 85% being used for personnel. The Center is not expected to generate revenue for the University, although it does generate a modest amount each year from fees for delivery of in-plant training activities or seminars.

Examples of Projects Undertaken

The Director has summarized the work of the Center as follows:

> For over twelve years, the Center has been striving to couple the problems of thousands of Tennessee firms with helpful resources. The firms served have varied greatly in size and level of sophistication, the problems have ranged from simple to impossible, and the needed resources have been found on campuses, in libraries, within state or federal agencies, in banks and insurance firms, and even on the payroll of a non-competing company in the next county. Through efforts initiated through the Center, companies have overcome product design problems, eliminated excessive noise levels, significantly improved the flow of work-in-process, gained improved control over inventories, relocated into better facilities, learned how to keep and use simple financial records, solved metallurgical problems, and trained foremen in human relations and communications.

Other Information

Conclusions by the Director concerning the work of the Center for the past eighteen years include the following:

1. We have learned that the people in charge of the companies that employee Tennesseans welcome help from academic staff, but that many times they will go without needed assistance rather than search for it themselves.
2. We have learned that the expertise of university faculty members and the skills of their students can be coupled successfully with current business and industrial problems, and that the field presence of industrially-oriented university staff increases the number of opportunities for such faculty/student involvement.
3. We have seen evidence of what appears to be a very broad need for on-going continuing adult education, designed and delivered to match the needs of the learner rather than those of the educational establishment.
4. We have demonstrated that a broad industrial assistance program can be administered by a university without infringement upon areas normally served by professional service organizations.
5. We have demonstrated that advantages accrue to both industry and academia when managers and professors walk through a plant together to work toward solution of a "real life" problem.